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Feasibility of a linear model of the ionospheric scale height based on LEO GNSS occultation data

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GPS radio occultations allow the sounding of the Earth's atmosphere, in particular the ionosphere. The physical observables estimated with this technique allow to test theoretical models of the ionosphere, as, for example, the Chapman and the Vary-Chap models. The former is characterized by a constant scale height, whereas the latter considers a more general function of the scale height and the height.

We propose to investigate the feasibility of a novel and simple model where the scale height varies linearly with the height. The scale height data provided by the radio occultations from a receiver on board a low Earth orbit (LEO) satellite, obtained by iterating with a local Chapman model at every point of the vertical profile provided by the GNSS satellite occultation, are fitted with the height, by means of a linear least squares fit (LLS), in order to test this hypothesis.

Preliminary results, based on FORMOSAT-3/COSMIC GPS occultation data, show that the scale height presents a more clear linear trend above the F2 layer peak height (hmF2) which can be in agreement with a temperature dependence, following ionospheric models like the IRI. Moreover, according to this preliminary analysis, the parameters of the linear fit do not depend significantly on the local time, whereas they do on latitude.